

Figure s

Figure 1

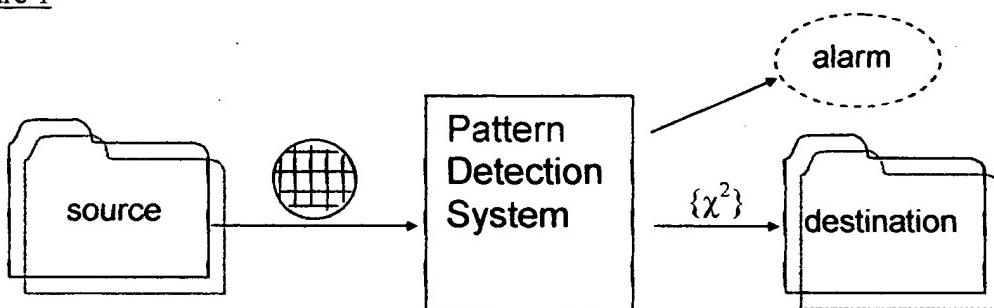


Figure 1 shows a schematic for a pattern detection system, including a data source; a computer equipped with a program for interpreting events in the data for each wafer and making the chi-squared calculations; and a result destination. Source and destination are represented by folders and the " $\{\chi^2\}$ " represents the collection of chi-squared values. Results may be sent to the destination in the form of a summary or may be inserted back into the data, which is then sent to the destination. The system may be configured to raise an alarm under certain conditions when chi-squared values exceed a specified threshold.

Figure 2

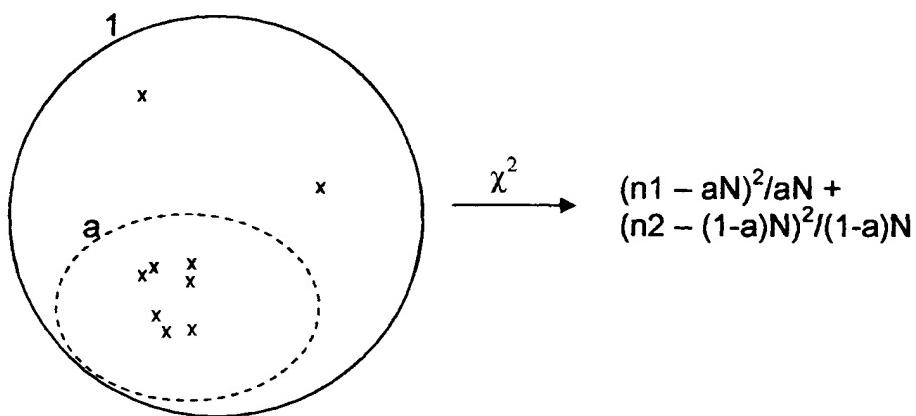


Figure 2 shows a wafer of area 1 and sub-region of area 'a' with events marked by "x". The area outside the subregion is $(1-a)$. There are n_1 events inside the sub-region and n_2 outside the subregion, with $N=n_1+n_2$ total events, and $(1-a)$ corresponding to the area outside the subregion. The chi squared value (χ^2) for the null hypothesis that the events are random is $[(n_1-aN)^2 / aN] + [(n_2-(1-a)N)^2 / (1-a)N]$

Figure 3

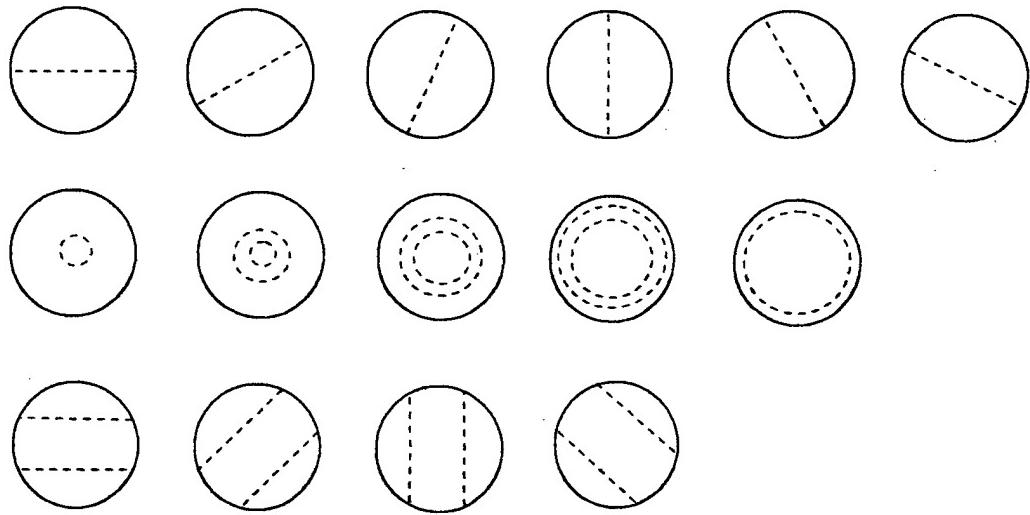


Figure 3. Top rows shows 6 lateral subdivisions of the wafer region, subdivision by diameter lines at angles in increments of 30 degrees. Middle row shows 5 concentric radial subdivisions, in radial increments of radius/5. Bottom row shows axial regions of width=diameter/3, at angles incrementing by 45 degrees.

Figure 4

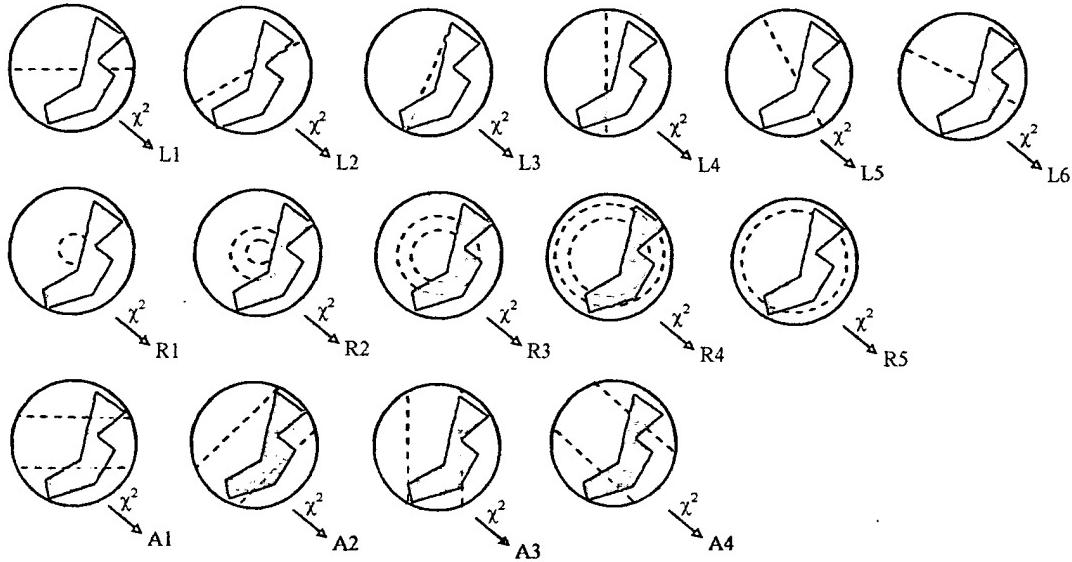


Figure 4 The events on the wafer are represented by an irregular grey domain. The illustration shows the calculation of 6 lateral chi-squared values (L1-L6), and 5 radial chi-squared values (R1-R5), and 4 axial chi-squared values (A1-A4). The system also calculates these summaries

$$\text{LMax} = \text{MAX}(L1, L2, L3, L4, L5, L6)$$

$$\text{RMax} = \text{MAX}(R1, R2, R3, R4, R5)$$

$$\text{AMax} = \text{MAX}(A1, A2, A3, A4)$$

$$\text{ChiMax} = \text{MAX}(\text{LMax}, \text{RMax}, \text{AMax})$$

Note in the illustration that L3, R5, and A2 will be the largest values

Figure 5

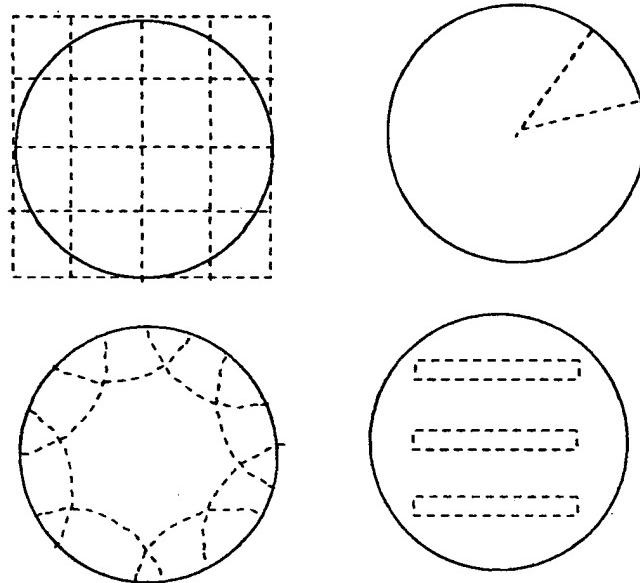


Figure 5 shows other obvious divisions into sub-regions of the wafer map area. Top row shows rectangular tiles, and angular sectors. Bottom row shows arc regions around the wafer edge and specialized rectangular zones.